Space Weather Forecast

Issued on Saturday 21 December 2024 at 12:02 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Minor/Moderate radio blackouts likely. High uncertainty geomagnetic forecast.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Activity has been moderate, with the peak flare observed at 21/0039UTC from a large and complex sunspot region in the southeast.

There are up to ten sunspot regions at present. The main changes in the period were rapid emergence of a group in the southwest, albeit from a low base complexity. To its east a larger group progressively showed fewer constituent spots, although this may be related to its deteriorating viewing position. The southeastern quadrant harbours a trio of nominally complex regions: the northernmost showed the emergence of a central penumbral spot but was otherwise largely unchanged. A group to its south showed proliferation of many small central spots to become compact. Finally, trends in AR3932 nearer the horizon were more difficult to ascertain, however the trailing penumbral spots appeared to increase in size over the past day.

Confidence in the roster of Coronal Mass Ejections (CMEs) is currently low, with significant imagery gaps in the period.

At the time of writing, the most notable possible CME progenitors (emitted nearest the middle of the Sun) included a possible small 'filament eruption' (arc of plasma) at 20/2200UTC from S10E010. This activity was accompanied by a slow mid-ranking Common-class flare. Also of note was another filament eruption 21/0430UTC from the southwest quadrant near S30W040. The northeastern quadrant also showed a potential two-stage filament lift-off from just east of the meridian at 20/1330UTC and completing at 20/2300UTC. Significantly, but likely further from the Sun-Earth line, a large filament lifted off the northwest 21/1100UTC, with imagery also pending.

Analysis of the above events is ongoing.

Solar Wind / Geomagnetic Activity: Solar winds have shown elevated conditions with uncertain cause - perhaps connection to an unseen westward promontory from a central 'coronal hole' in the southwestern quadrant. The solar wind speed increased overall from slightly elevated to elevated levels. The number of particles in the solar wind were at background. The associated magnetic field was slightly elevated, with an erratic north-south component.

The net result of the above solar wind measures was disturbed but below Minor Storm G1 at peak.

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Energetic Particles / Solar Radiation: High energy proton flux gradually increased in the period but remained sub-Minor Solar radiation storm S1 (10pfu), reaching 2.1pfu at 21/1110UTC before apparently stabilising - it is not yet clear as to whether this is a temporary trend or not.

Four-Day Space Weather Forecast Summary

Solar Activity: Isolated Moderate-class flares are likely, mainly from the southeast of the Sun, perhaps bolstered slightly after the current UTC weekend by returning regions. A slight chance of isolated Strong-class flares is maintained throughout.

Solar Wind / Geomagnetic Activity: No Earth-directed CMEs currently feature in the forecast, although this aspect carries notably low confidence and there are as-yet unassessed CME candidates from the past 24 hours.

Current solar winds are elevated via an uncertain mechanism, potentially early connection to a coronal hole, which itself is a non-persistent feature (wasn't present 27 days ago), which also serves to lower forecast confidence. Overall, there is a slight chance of Minor Storm G1 conditions into the new UTC week as a result.

Energetic Particles / Solar Radiation: There is a chance of S1-level enhancements in the current UTC weekend due to current slightly enhanced near-Earth proton counts. This risk should relax back in the absence of further suitable flares, with most of the risk from the front-side then tied to the westward advance of the complex southeastern trio sunspot regions.

Geomagnetic Storms

Geomagnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	**G1 to G2**	No	5	5	5	5
Strong	**G3**	No	1	1	1	1
Severe	**G4**	No	1	1	1	1
Extreme	**G5**	No	1	1	1	1

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Radio Blackouts - X-Ray Flares

X-Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 (M Class)	Yes	70	70	75	75
Very Active	R3-R5 (X Class)	No	10	10	10	10

Solar Radiation Storms (High Energy Protons)

Radiation Storms	Level ($cm^{-2}sr^{-1}s^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	25	20	15	20
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and/or 50 MeV ≥ 10pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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